Author Index

Adam A E, What Can the History of AI Learn from the History of Science? 232
Andersen P B and Holmqvist B, Interactive Fiction; Artificial Intelligence as a Mode of Sign Production 291

Bannon L J, A Pilgrim's Progress: From Cognitive Science to Cooperative Design 259
Barcelo J A (*book review*) 330
Bradshaw G L. *See* Langley H A et al.

Chater N. *See* Oaksford M et al.
Clark A and Lutz R, Guest Editorial – Introduction 3

Davies M, Thinking Persons and Cognitive Science 39
Diaper D, Knowledge Elicitation: Principles, Techniques and Applications (*book review*) 165

Ehn P, Work-Oriented Design of Computer Artifacts (*book review*) 163
Engelmore R and Morgan T, Blackboard Systems (*book review*) 166

Finnemann N O
Computerization as a Means of Cultural Change: On the Relations Between Information Theories and the Idea of an Information Society 314
Editoral 257
French R. *See* Kaplan S et al.
Furukawa T, AI in Medicine: A Japanese Perspective 196

Gill K S
(*book review*) 165
Conference Report 331
Editorial 171
Gill S P (*book review*) 166

Hennessy J A (*book review*) 330
Holmqvist B. *See* Andersen P B and Holmqvist B

Ikuta K, The Role of 'Craft Language' in Learning 'Waza' 137

Kaplan S, Weaver M and French R, Active Symbols and Internal Models: Towards a Cognitive Connectionism 51
Kobsa A, User Modelling in Dialog Systems: Potentials and Hazards 214

Langley P et al., Scientific Discovery. Computational Explorations of the Creative Process (*book review*) 329
Lutz R. *See* Clark A and Lutz R
Lytje I, Natural Language Understanding Within a Cognitive Semantics Framework 276

Memmi D, Connectionism and Artificial Intelligence as Cognitive Models 115
Miles I et al., Mapping and Measuring the Information Economy (*book review*) 330
Morgan T. *See* Engelmore R and Morgan T

Nakamura K. *See* Satofuka F and Nakamura K
Nuki T, The 'Transfer of Skill' and the 'Transfer of Human Relations' to Machine Systems 173

Oaksford M, Chater N and Stenning K, Connectionism, Classical Cognitive Science and Experimental Psychology 73

Ross P, Advanced Prolog: Techniques and Examples (*book review*) 167
Rutkowska J C, Action, Connectionism and Enaction: A Developmental Perspective 96

Satofuka F, Editorial 93
Satofuka F and Nakamura K, AI: A Strategic Technology in Japan 154
Schefe P, The Impacts of Expert Systems on Working Life – An Assessment 183
Schimonovich W. *See* Weibel P and Schimonovich W
Simon H A. *See* Langley H A et al.
Smith S (*book review*) 167
Stenning K. *See* Oaksford M et al.

Trappl R, Power, Autonomy, Utopia: New Approaches to Complex Systems (*book review*) 164

Vaux J, Editorial 1

Walker S F, A Brief History of Connectionism and its Psychological Implications 17
Weaver M. *See* Kaplan S et al.
Wiebel P and Schimonovich K, Kurt Gödel: A Mathematical Mystery (*book review*) 242

Yamaguchi E, Effects of Computers on Japanese Schools 147

Zytkow J M. *See* Langley et al.

Subject Index

Accessibility of content 44
Action control 103–7
Active symbol-based associative knowledge structure 64
Active symbols 57–60, 63
  and control mechanisms 59–60
  functional properties of 60
  pattern-recognizing function of 63
Activity-level coding 60
Activity theory 262–4
AGE 166
ANTICIPATOR 201
Artificial intelligence (AI)
  and artistic form 305–7
  and computer-based signs 298
  and connectionism 132–5
  and history of science 234
  and history of technology 236–7
  and philosophy of science (book review) 329
  and sociology of knowledge 234
  as cognitive model 115–36
  and cognitive science 237–8
  classical 132–5
  definition 117, 293
  historical approach 232–5
  history of 232–41
    Darwin and Turing 238–9
  hybrid system 134–5
  implementation issues 307–9
  in Japan 154–62
  level of explanation 117–19
  ontological view 293
  organizational history 235–6
  pragmatic view 293
  processing style 119–21
  representational structure 121–3
  symbolic 117, 118, 135
Artificial lesioning 12
Association 62
  drainage mechanism of 23
  mechanisms of 25
  phenomena of 22
Associationism and connectionism 53, 56–7

Back-propagation networks 9
BACON.3 329
BACON.5 329
BB1 166
Behaviourism
  and connectionism 53
  Skinnerian 28
  Watsonian 27
Blackboard systems 166
Boltzmann machines 9, 10, 125

CAI 147–62
Categorization in cognitive semantics 279
Causal embedding 103
Causal structure 62
Causal systematicity 46–8
Causality 62–3
Cell-assemblies 58
Cerebral cortex
  Pavlov's theory of 25–7
  purpose of 65
  topographical organization of 27
Classification couples 58
Cluster analysis 12
Cognition
  credentials of 40–2
  paradox of 15
  realm of 39
  understanding of 13
Cognitive architecture 32
Cognitive grammar, according to Langacker 279–81
Cognitive linguistics 276
Cognitive maps 30, 64, 65
Cognitive modelling 67, 115–36
Cognitive psychology 265, 266
  discipline of 40
Cognitive science 39–50, 259–75
  discipline of 40
  outline of 261–2
Cognitive semantics
  according to Lakoff 277–9
  and natural language understanding 281–3

Cognitive semantics *(cont.)*
categorization of 279
COMEX 200
Communication, impact of expert systems on 191–2
Communicative medium, computer as 324–6
Competitive learning 10, 125
Compilation doctrine 134
Complex systems, new approaches to 164
Computer artifacts, work-oriented design 163
Computer-based signs 294–9
and AI 298
classification of 295
example 299–305
interpretation of 299
Computer models 68
Computer Support for Cooperative Work (CSCW) 268
Computers
and cultural change 314–28
as communicative medium 324–6
as dialog partners 215–17
as encyclopedias 214–15
in Japanese schools 147–62
new conceptions of 257
Conceptualized content 45–7
Conditioned reflexes 25
Connection reflexes 25
Connectionism 1
and AI 132–5
and associationism 53, 56–7
and behaviourism 53
and empiricism 33–4
and enaction 96–114
and innate knowledge 99–103
architecture and properties 3
as cognitive model 115–36
as response to paradox of cognition 15
as vindication of behaviourism 27
classes of system 6
comparisons of old and new 32–8
criticisms of 52–66
definition 17, 123
history of 17–38
hybrid systems 134–5
in earlier psychologies 19–31
in human development 96–114
level of explanation 126–8
models 13, 15
new qualities offered by 135
practical implications 34–5
processing style 128–30
promise and prospects of 13, 14, 46
psychological implications 17–38
representational structure 130–2
rise of 13
subsumption of classical AI methods 135
Thorndike's 24–5
versus classicism 74–5
Connectionist diagrams 21
Connectionist models 42, 46, 52
Consciousness 42–4
accessibility of content to 44
Context-dependence 12–13
Control mechanisms 59–60
Cooperative design 270–3
Cooperative information 222
Craft language 137–46
CRYSALIS 166

DALTON 329
DEBUGGY 223
Decision making 62
Declarative representation 119
DEMOS 163
Dialog contributions, assumptions from 219
Dialog systems
default assumptions 217
potentials and hazards of application 222–7
user modelling in 214–40
see also User modelling
Distributed parallel processing. *See* Parallel distributed processing (PDP)
Distributed representations 12–13, 22, 127, 128
DIZZY 200
DOCTORS 205–6, 208
Doxastic states 43, 46

Empiricism and connectionism 33–4
Enactment 309–12
Encyclopedias, computers as 214–15
Energy function 9
Entity-relationship diagrams 283, 287–8
Environment models 65
Environmental patterns 62–3
Environmental sequence 65
Error function 9
Experience hypothesis 20
Expert systems
contents of work 188–91
impact on working life 183–95
medical 196–213
socio-economic risks of 184–6
trainable 54
training and education needs 192–4

Fatigue 59–60
Feed-forward pattern associator (FFPA) models 53–6
Fifth Generation Computer System (FGCS) 154–62
FLUIDEX 203–5, 207
FORTRAN 199, 200
Functionalism 118

Generality Constraint 46, 47
Generalization 60
GLAUBER 329
GLAUCOMA 199
GLAUCOMA/LOOKS 209
Gödel, Kurt (book review) 242
GRUNDY 219–20, 225, 226

Habit concept 23–4
HAM-ANS 220, 223

HASP/SIAP 166
HEARSAY-II 129, 166
HEARSAY-III 166
Hebb rule 22, 125
Hidden processes 30
Higher-level processes 60–6
History of science 232–41
Hourglass methodology 14
Hourglass structure 11
Hullian stimulus-response theory 28–31
Human-Centred Technologies, International Workshop on 247–56
Human-computer interaction 266–70
Human development
  classical and connectionist computational concepts 96–114
  feedback and teaching in 108
Human Frontier Science Programme (HFSP) 154–62
Human-information processing model 268
Human intelligence, role of craft language 137–46
Hybrid systems incorporating symbolic and connectionist techniques 134–5

Idealized cognitive models 277
Image schematic concepts 277–8
Inference 46–8
  classicism versus connectionism 77–9
  modelling 85–6
  theory 81–3
Information
  as component of paradigmatic changes 321–2
  concepts of 314–19
  distinction between notions of 319
  in mathematical-physical theory 315–16
  in theories of the society 320–1
  methematical concept of 316–19
  problems of understanding new theoretical knowledge when implemented in machines, organizations and society 322–4
  traditional concept 314–15
Information economy (book review) 330
Information society, concept of 320–1
Information Technology Assessment, conference report on 331
Inhibition 23, 59–60
Interaction 309–12
Interactive activation models 125
Interactive fiction 291–313
Internal sequence 63
Investigation methods 264–5
Isolation at work 176
  factors promoting 177–81
  measures designed to cope with 181–2

Japanese traditional artistic performances 137–46

Kata (habitus) 137–46
Katachi 137
KNOME 220
Knowledge-based systems 184
Knowledge elicitation 165
Knowledge structures
  active symbol-based associative 64
  first-order 61–5
  second-order 65–6
  sequentially based 62

Law of forward direction of neural conduction 22
Law of neural habit 22
Learning algorithms 8
Learning networks 107
Learning procedures 124
Lexicon in text analysis 283–6
LISP 122, 199
Localization of function 20
Logic, difficulty and adaptation 67–8
Logical atomism 122
Logicism in AI 14

Machine systems 173–82
Man-machine interface 173
MECS-AI 196, 199
Mediating responses 29–30
Medical expert systems 196–213
Medical knowledge
  acquisition 208
  structure – analysis, representation 206–8
Memory
  classicism versus connectionism 75–7
  modelling 83–5
  theory 79–81
Metaphoric mappings 277–8, 282
Metaphorical concepts 278–9
Meta-system 223
Metonomy 278–9
Metonymic mappings 277–8, 282
MICRORHEUM 199, 200
Modularity of mind 49
Montague paradigm 276
MXA 166
MYCIN 196, 197

Narrative techniques project 292–3
Natural language understanding 276–90
  and cognitive semantics 281–3
Networks
  asynchronous 7–9
  back-propagation 9
  constraint satisfaction 9
  constraint violation 9
  non-linearities in 6
  production systems 174–5
  properties of 3
  question of scale 11
  research problems 11
  stochastic 8, 9
  synchronous 7
  see also Neural networks
Neural connections 24

Neural networks
  classification of 123–6
  history of 123
  non-representational 127
  processing style 128–30
  representations 127
  Spencer's 19
Neural organization, evolution of 20
Neural plausibility 32

Object representations 58
Opposite-learning gradient 68

Parallel distributed processing (PDP) 26, 33, 48, 74, 85, 88, 97, 101, 103, 106, 107, 112, 131, 133
Parallel processing 120, 128–30
Pavlovian conditioning 25–7
Perceptron 124
Physical symbol system hypothesis (PSSH) 97, 99–102, 110, 111
Privacy laws 227
Problem solving 61–2, 65
Problem space 61
Production systems, network-type 174–5
PROLOG 122, 167, 199, 201, 284
Prudent conduct 23
Psychology
  principles of (James) 20
  principles of (Spencer) 19

Random self-organizing networks 33
Recognition codes 58
REPLIX 223
Rescorla-Wagner equation 28
RHINOS 202

Segregation doctrine 133
Semantic contents of states of visual processing 43
Semi-linear activation functions 7, 9
Sensory-motor reflexes 24
Sequence 61–2
  and causality 62
Sequential processing 120
Serial associations 23
SHELP 202–3
Situation-response formula 25
Social canalization 108
Socio-economic risks of expert systems 184–6
Sociology of knowledge 232–41
Spatial sequences 63
Spinal reflexes 26
S-R model 55
STAHL 329
Statistical analysis 12
Stimulus-response theory
  domain of 30–1
  Hullian 28–31
Structure-sensitive operations 66
Subdoxastic states 41, 43, 46
Symbol formation and properties 60
Symbol structures 227
  and human development 99–103
  input and output 103
Symbol systems 261
System scale 103–7

TAnal 283–8
Taylorism 186
Teaching concept in Japan 148–50
Technological linkages 93
Terminal-based working conditions 175
Text analysis 283–8
Thinking, structure of 45–6
Thought
  and the thinking self 32
  language of 48
  nature of 13
  productive 14
  systematic 14
Transfer of functional relationships 176
Transfer of human relations 173–82
Transfer of mental relationships 176
Transfer of skill 173–82
Truth Maintenance System 129
Tutoring Systems 152–3

UNIT concept 280
UNIX 220–1
UNIX Consultant 220
User awareness, consent and control 224–5
User behaviour 267
User beliefs, sources for assumptions about 217–18
User input, assumptions based on 218–19
User modelling 218
  consequences of 227–9
  in dialog systems 214–40
  legal restrictions 226–7
  potentials and hazards of application 222–7
  reliability of assumptions 226
  research in 219–22
  short-term goals and beliefs vs. personality traits 225–6
  use of term 214–17
User supervision 223–4
User support 267
User tutoring 223
UTI-LISP 196
UTOPIA 163

VAX/VMS 223
VENUS 291
VIE-DPM 220, 225
VIE-LANG 220
Von Neumann computer 119

Waza (skill) 137–46
WEST 223
Widrow-Hoff rule 28
WIZARD 223